CLAIMS

1. High-frequency plasma beam source with a plasma chamber (3) for a plasma, electrical means (8, 9) for igniting and sustaining the plasma, an electrical grid (4) lying at a high-frequency potential for extracting a plasma beam (I) from a plasma chamber (3), as well as an exit opening, preferably to a vacuum chamber (7), the extraction grid (4) being arranged in the area of the exit opening, characterized in that the plasma beam (I) is made substantially divergent.

2. High-frequency plasma beam source according to claim 1, characterized in that the divergence of the plasma beam (I) is brought about by a specific interaction between the plasma and the extraction grid (4).

3. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that, for the achievement of a high uniformity of the plasma current density on at least a portion of a surface, the plasma beam (I) is adapted to the shape of at least a portion of the surface.

4. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that the extraction grid (4) as seen from the plasma chamber (3) is of concave or convex shape, while preferably at least a portion of the area of the extraction grid is a section of the circumferential surface of a cylindrical solid body.

5. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that the extraction grid (4) is inhomogenous over at least a portion of its surface.

6. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that at least one mask disposed outside of the plasma chamber (3) is provided.

7. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that the exit opening is covered with masks in partial areas.

8. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that the extraction grid (4) has meshes with a mesh width that is less than the thickness of the space charge zone between extraction grid (4) and the plasma in the plasma chamber (3).

9. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that the extraction grid (4) has meshes with a mesh width that is at least as large as a thickness of a space charge zone between the extraction grid (4) and the plasma in the plasma chamber (3).

10. High-frequency plasma beam source according to claim 9, characterized in that the extraction grid has meshes with a mesh width that is at most so large that the plasma still remains essentially in the plasma chamber (3).

11. High-frequency plasma beam source with a plasma chamber (3) for a plasma, electrical means (8, 9) for igniting and sustaining a plasma, a planar extraction grid (4) lying at a high-frequency potential for the extraction of a plasma beam (I) from the plasma chamber (3) as well as an exit opening, preferably to a vacuum chamber (7), the extraction grid (4) being arranged in the area of the exit opening, characterized in that the plasma beam has a high parallelism, and that at least one mask disposed outside of the plasma chamber (3) is provided with which the plasma beam (I) can be modulated for producing a high homogeneity of the plasma beam density on at least a portion of the surface of a dome (11).

12. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that at least one mask is given an electrical potential for the modulation of the plasma beam (I).

13. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that, in a coating chamber (7), substantially opposite the exit opening, a curved surface, preferably a dome (11), is arranged with substrates (10.1, 10.2, 10.3, 10.4, 10.5, 10.6).

14. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that, in addition to the high-frequency plasma beam source (1) a vaporization source is provided.

15. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that, the extraction grid (4) is formed from a tungsten mesh with a wire thickness of about 0.02 - 3 mm, preferably 0.1 - 1 mm.

16. High-frequency plasma beam source according to at least one of the foregoing claims, characterized in that, at least one magnet (5) is provided for enclosing the plasma in the area of the plasma chamber (3).

17. Vacuum chamber with a housing (2), a high-frequency plasma beam source and a surface to be irradiated, characterized in that the high-frequency plasma source (1) is formed according to at least one of the foregoing claims.

18. Vacuum chamber according to claim 17, characterized in that the surface to be irradiated is curved, preferably a dome (11) and includes one or more substrates (10.1, 10.2, 10.3, 10.4, 10.5, 10.6).

19. Method for irradiating a surface with a plasma beam from a high-frequency beam source, characterized in that a divergent plasma beam (I) is used and the high-frequency plasma beam source is constructed according to at least one of claims 1 - 16.

20. Method according to claim 19, characterized in that the plasma beam (I) has a beam characteristic with a divergence of at most n = 16, preferably n - 4, n being an exponent of a cosine distribution function.

21. Method according to at least one of claims 19 and 20, characterized in that the beam characteristic of the plasma beam (I) is brought about by a specific interaction between the plasma and the extraction grid (4).

22. Method according to at least one of claims 19 to 21, characterized in that a specific interaction is used between an extracted plasma and at least one mask arranged outside of the plasma chamber (3).

23. Method according to at least one of claims 19 to 22, characterized in that to achieve a great homogeneity of the plasma beam on at least a portion of a surface the beam characteristic of the plasma beam (I) is adapted to at least a portion of the irradiated surface.

24. Method according to at least one of claims 19 to 23, characterized in that a curved surface, preferably a dome (11) is provided.

25. Method according to at least one of claims 19 to 14, characterized in that by the irradiation of the surface a coating of the surface takes place.

26. Method according to at least one of claims 19 to 25, characterized in that a modification and/or cleaning of the surface is performed by the irradiation of the surface.